**Gas Law Problems #1**

*Use Charles’, Boyles, Dalton’s, and the combined gas law to solve the following problems on a speperate sheet of paper. All work must be shown to receive credit:*

P1V1 = P2V2 V1/T1 = V2/T2 P1V1/T1=P2V2/T2

*P*total = *P*1 + *P*2 + . . . *P*n Pdry gas = Ptotal - Pwater vapor

1) If I initially have a gas at a pressure of 12 atm, a volume of 23 liters, and a temperature of 200 K, and then I raise the pressure to 14 atm and increase the temperature to 300 K, what is the new volume of the gas?

2) A gas takes up a volume of 17 liters, has a pressure of 2.3 atm, and a temperature of 299 K. If I raise the temperature to 350 K and lower the pressure to 1.5 atm, what is the new volume of the gas?

3) A metal tank contains three gases: oxygen, helium, and nitrogen. If the partial pressures of the three gases in the tank are 35 atm of O2, 5 atm of N2, and 25 atm of He, what is the total pressure inside of the tank?

4) A gas that has a volume of 28 liters, a temperature of 45 0C, and an unknown pressure has its volume increased to 34 liters and its temperature decreased to 35 0C. If I measure the pressure after the change to be 2.0 atm, what was the original pressure of the gas?

5) A gas has a temperature of 14 0C, and a volume of 4.5 liters. If the temperature is raised to 29 0C and the pressure is not changed, what is the new volume of the gas?

6) If I have 17 liters of gas at a temperature of 67 0C and a pressure of 88.89 atm, what will be the pressure of the gas if I raise the temperature to 94 0C and decrease the volume to 12 liters?

7) Blast furnaces give off many unpleasant and unhealthy gases. If the total air pressure is 0.99 atm, the partial pressure of carbon dioxide is 0.05 atm, and the partial pressure of hydrogen sulfide is 0.02 atm, what is the partial pressure of the remaining air?

8) I have an unknown volume of gas at a pressure of 0.5 atm and a temperature of 325 K. If I raise the pressure to 1.2 atm, decrease the temperature to 320 K, and measure the final volume to be 48 liters, what was the initial volume of the gas?

9) If the air from problem 7 contains 22% oxygen, what is the partial pressure of oxygen near a blast furnace?

10) 1.00 L of a gas at standard temperature and pressure is compressed to 473 mL. What is the new pressure of the gas?

11) If I have 21 liters of gas held at a pressure of 78 atm and a temperature of 900 K, what will be the volume of the gas if I decrease the pressure to 45 atm and decrease the temperature to 750 K?

12) A man heats a balloon in the oven. If the balloon initially has a volume of 0.4 liters and a temperature of 20 0C, what will the volume of the balloon be after he heats it to a temperature of 250 0C?

13) If I have 2.9 L of gas at a pressure of 5 atm and a temperature of 50 0C, what will be the temperature of the gas if I decrease the volume of the gas to 2.4 L and decrease the pressure to 3 atm?

14) I have an unknown volume of gas held at a temperature of 115 K in a container with a pressure of 60 atm. If by increasing the temperature to 225 K and decreasing the pressure to 30 atm causes the volume of the gas to be 29 liters, how many liters of gas did I start with?

15) A soda bottle is flexible enough that the volume of the bottle can change even without opening it. If you have an empty soda bottle (volume of 2 L) at room temperature (25 0C), what will the new volume be if you put it in your freezer (-4 0C)?

16) Assume the respiratory rate for a person is 15 breaths per minute and one breath contains 500 cm3 of air at 20oC and 99.5 kPa. What volume of air, in cubic meters, corrected to standard conditions, does an individual breathe in one day?

17) A mixture of oxygen, hydrogen and nitrogen gases exerts a total pressure of 278 kPa.  If the partial pressures of the oxygen and the hydrogen are 112 kPa and 101 kPa respectively, what would be the partial pressure exerted by the nitrogen.

18) A **sample of hydrogen gas is collected over water at 14.0oC (**Vapor pressure water, 11.99mmHg)**.  The pressure of the resultant mixture is 113.0 kPa.  What is the pressure that is exerted by the dry hydrogen alone?**

19) 888 cm3 of oxygen are collected over water with a temperature of 25 oC.  The total pressure of the gases is 55.8 kPa.  What is the partial pressure of the dry gas?

20) 400.0mL of hydrogen are collected over water at 18.0°C (Vapor pressure water, 15.5mmHg) and a total pressure of 740.0 mmHg.

a) What is the partial pressure of H2?

b) What is the volume of DRY hydrogen at STP?

Key

1. 29.57L

2. 21.54L

3. 65atm

4

5

6

7

8. 117L

9

10

11 30.3L

12. 0.74L

13

14

15. 1.81L

16. 9.88m3

17

18

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20